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CONTAGIOUS STREPTOCOCCAL MASTITIS OF CATTLE*

Possible Extension of Field Control on a National Scale and the Role of the Practitioner

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[Dr. RUSSELL GREIG, in introducing Dr. Watts, explained that the scheme they were about to discuss had been drawn up by the Mastitis Committee of the Agricultural Research Council.

The proposed scheme was still in a rough form, but was designed so that the veterinary practitioner should play a pivotal part in it. Because of this he had arranged with the approval of the Ministry of Agriculture and the Agricultural Research Council to have the scheme discussed at this meeting of representative practitioners so that the practitioner's views upon the scheme and his general reactions towards it might be obtained. For this reason it was hoped that a full and free discussion would follow Dr. Watts' paper,]

I must thank your President for his kind invitation to address you to-day. I greatly appreciate the honour which, I presume, has been paid me for two reasons. Firstly, I have had considerable experience of mastitis control work in the field as I have about 65 herds under eleven veterinary practitioners in the West of Scotland under control at the moment, and secondly, I happen to be the Secretary of the Committee of the Agricultural Research Council which has evolved the scheme we are to discuss to-day. I suppose your President felt that I should have a fair idea of the difficulties to be expected both in the field and in the laboratory. In any case, whatever his reason, I do appreciate his invitation.

I am sure you have all read the many articles on this disease published by the British workers Minett, Stableforth and Edwards, and I do not intend to enter into any description of the disease itself nor of the bacteriological work except such of the latter as is essential in control measures. I will therefore start right away in an account of the position of control work as it is to-day, and the developments it is hoped will soon be possible. With regard to both I must emphasise that any opinions I may express are entirely my own and are not in any way official, neither is the scheme I shall describe in anything but the preliminary stages, and it has not yet been put before the Executive Committee of the Agricultural Research Council or the Ministry.

*Address to the Scottish Metropolitan Division, N.V.M.A., at a meeting held in Edinburgh, November 9th, 1940.

As you know, some years ago it was considered that if all the cows in a herd were examined bacteriologically by means of a plating technique, and all those animals which showed *Str. agalactiae* isolated from those not showing it then, provided sufficient care were taken to prevent infection of the free stock from these infected animals, the farm would remain free and thus in course of time a herd completely free from mastitis would be built up. This may be termed the "Eradication by Segregation Scheme," and was especially based on the remarkably good results obtained by Minett and his co-workers in some of their herds.

Now this scheme depended for its success on several definite factors which were :—

1. The presence of the organism *only* in the cow's udder, *i.e.*, it was considered an obligatory parasite incapable of prolonged existence outside its normal habitat, the udder.

2. The detection by the technique used of all cows shedding the organism.

3. The care taken by the byre-man to prevent re-infection and the suitability of the premises for isolating the cattle infected.

With regard to 1 and 2, it must be pointed out that the authors of the scheme did not claim that either of these two factors was absolute. They did not suggest that *Str. agalactiae* could not exist outside the udder for any short period of time. They merely confined themselves to saying that as they were not able to find it outside the udder it must, under normal conditions, *rapidly* die out. As to 2 (the detection of all cows infected), they definitely made an arbitrary level of infection, *viz.*, 50 colonies per plate (and in some cases they also considered the centrifuge deposit) before definitely deciding a cow was infected and so they presumably allowed slightly affected animals to remain in the free herd. This is indeed an essential under present conditions if the major portion of the herd is not to be in the infected section.

Further work on the disease has tended, however, to show that these factors are even less absolute than was thought. In America and in my own laboratory it has been found that the organism is capable of prolonged periods of survival, ranging up to months, outside the animal body. There is so far no suggestion that it can actually multiply but it can certainly exist and it does not die out for some time. It is to be

presumed that if this is so the hands, clothes, etc., of the milkers in any normal herd are bound to be contaminated to a greater or lesser extent. The byre itself can also presumably harbour the organism in the dust for a considerable time, though again it must be emphasised that it has not actually been recovered from this material. Thus, although probably the ultimate reservoir of the infection is the cow's udder, there are good grounds for believing that the contagion can exist for some time outside the body and can thus be carried passively from one cow to another even though there is no very direct contact between the cows. This fact must cause very considerable misgivings about the success of any scheme based on the segregation of infected stock even where treatment is included, but it does not entirely rule out the possibility of ultimate success where the scheme can be continued for many years, when possibly the steady reduction of the amount of infection which might be expected by the application of treatment and segregation of heavily infected stock might lead to a position from which more rigorous methods, such as the sale of all reactors, might lead to actual eradication. There are, however, a lot of " mights."

Further, with regard to the second point, the diagnostic method : it is agreed by all, including the authors, that the usual plate test, though the most valuable and reliable method we can adopt on any sort of large scale, does not reveal every case, and further that even some of the cases it does show, *i.e.*, cows with but few germs in the milk, should not usually be reported as positive cases owing to the frequency with which they become negative to the test again. It is of small value in any practical scheme to interpret a test in such a way that the same cow varies from test to test between positive and negative, and thus between the infected and the clear herds. The explanation of these variations in the results from test to test is twofold. First, the cow may, if very lightly infected, clear herself, and particularly may this be so when the infection has appeared late in lactation and the cow has been put dry soon afterwards. On calving down she may be negative and has obviously cleared herself during the dry period ; and second, the test may not be delicate enough to show all the cows infected slightly and thus the cow only lightly infected and which is excreting a variable number of organisms from day to day may on occasion appear negative, though she is really a positive cow. These cases are not numerous but they do occur, and it is usual to have some limit (as already mentioned) above which a cow is classed as positive and below which she is left negative. In many cases, therefore, a negative report means only relative freedom from infection and not absolute freedom. This should always be borne in mind by any practitioners who receive a report on a *herd* test. Where only a single sample from a specific cow of which the practitioner is suspicious is examined the absolute criterion would be applied, *i.e.*, however few the organisms present it would be considered positive, since the suspicions of the practitioner would be deemed to be added evidence of infection. Another point which may be made here is that in acute cases or where the milk is grossly altered, it is common for the organism not to be found, though it is actually the causal germ. This is due probably to the presence of antibodies or other anti-bacterial substances in the secretion which lead to the death or inhibition of the organism. It is therefore often not possible to give a definite answer as to whether a certain sample of altered milk is due to contagious mastitis or not.

These points refer to the first two factors mentioned. What of the third, the interest of the byreman and the suitability of the premises ? Here we have what is probably the biggest stumbling block to all our efforts to eradicate the disease. Very few indeed of our commercial herds are housed under conditions where strict isolation is possible and even fewer where separate attendants and complete gear can be provided for the different sections of the herd. We must in most cases depart greatly from the standard normally considered necessary for adequate isolation, and put up with something very far from satisfactory however willing the farmer may be.

This question of the willingness or degree of co-operation of the farmer leads to another point. It has, I think, tended to be forgotten by many people that the presence of the germ, though essential to the disease, is not the whole story. There is also the cow, whose role is now recognised as being extremely important. The causes of the losses in mastitis fall under three heads. 1. The loss of milk due to the presence of the chronic disease. 2. The loss of quarters due to acute flare-ups of the disease. 3. The shortening of the productive life of the cow by the combination of 1 and 2. How can the cow herself affect these types of loss ? We have seen that the organism itself is fairly ubiquitous and therefore we should suppose that all cows would be affected and all would suffer to a like extent unless there is some individual or herd resistance to the disease. The fact that all cows in a herd are not affected to a similar extent or that some have a longer life in a herd before becoming so affected that they are no longer of value, points to individual resistance, and the great variations found in both the degree of infection and its severity in different herds show that there is at least an apparent herd immunity. We can do something perhaps to increase both these kinds of immunity and it is along these lines that a scheme has been evolved and put forward as a basis for a scheme which it is hoped will be adopted by the Ministry of Agriculture.

MASTITIS CONTROL SCHEME

The scheme envisages the attempted control of mastitis along four lines :

1. The increase of the apparent herd immunity.
2. The detection of the cows most likely to be spreading heavy infection and their treatment.
3. The treatment of acute cases.
4. The removal or segregation of all cows which fail to respond to treatment, *i.e.*, have such a slight individual resistance that they cannot overcome infection even when helped by chemotherapy.

I will discuss these points *seriatim*. With 1, the increase of the apparent herd immunity, the ruling word is ***apparent***. I do not think anyone has seriously suggested that there is any actual herd immunity to the disease inherent in the animals themselves, though it has been claimed in America that by breeding from a bull which threw cows with small tight teats, the incidence of the disease was decreased. Unfortunately other measures were taken at the same time and these, and not the type of teat, may have been the

governing factors in the reduction in the incidence of the disease reported by the workers concerned. The great variation in the disease from herd to herd is almost certainly in most cases due to environmental conditions, *i.e.*, to the whole manner in which the cow is treated. Where the animals are regarded as machines, pushed for milk production, highly fed, savagely milked by high pressure machine milking, improperly stripped, irregularly milked with neglected teat injuries and soiled litter not adequately and regularly removed, then a high incidence of mastitis is to be expected. When proper care is taken of each individual animal and the usual precautions as to cleanliness and hygiene are observed, then either the incidence is low or the severity of the infection is less, as judged by the length of productive life of the cows and the number of lost quarters in the herds. In most herds, therefore, where losses from mastitis are severe, these losses can be reduced by proper attention given to the cows. The actual incidence of the disease is probably not much affected, but the extent of its ravages is reduced by the lessening of the severity of the infection. This is presumably due to the fact that most cows are apparently capable of maintaining, more or less, a balance between themselves and the bacteria, so that though the germs are present in the udder they are restrained and do not cause severe damage unless the cows are affected by something which lowers their vitality. This is not to say that infection by the streptococci of mastitis does not always cause some damage. However resistant the cow may be, once she is permanently infected damage is done to the udder tissue and this damage is progressive ; therefore it is not sufficient merely to apply these hygienic measures but they must be supplemented by some more definite measures for attacking the disease. These measures are the early detection of the infection and its treatment by the most effective methods possible.

How can mastitis infection be detected ? There are four possible means.

1. By using delicate bacteriological techniques designed to reveal all cases of infection, however slight.

2. By using the present plating method or some other similar or simpler media which reveals all reasonably heavily infected animals.

3. By the use of the so-called Indirect Tests. These are either chemical or histological tests of the milk designed to reveal abnormalities which are more or less loosely related to contagious mastitis ; and

4. By tests in the byre such as the strip-cup and clinical examination by veterinary surgeons.

Which of these methods or which combination of these methods are of the most practical value at the present time, bearing in mind all factors operating during the war ?

Method 1, delicate bacteriological tests. These are quite impossible on any wide scale. For one thing they reveal far too many cows ; in any ordinary herd practically all the animals would probably be considered infected. And they are, in any case, far too complicated and time-consuming for general use.

Method 2, the usual plating method, also suffers from the latter fault. There simply is not either the laboratory material or the number of workers available for the method to be very greatly extended. Also it is costly. There is some possibility that a simpler and cheaper method, giving comparable results, will be available, but this is still in the experimental state and is not definite yet.

Method 3, the indirect tests. These suffer from the serious disadvantage that they disclose any abnormality such as drying off or early lactation milk, non-specific mastitis of any kind and so on. They are therefore too delicate and too inaccurate from the point of view of diagnosing contagious mastitis to be of great value for our purpose. Also, they are laboratory tests, and it is essential for the success of the scheme that any laboratory tests associated with it should be as accurate as possible.

Method 4, the byre tests, are unreliable, especially in failing to detect infected animals, but if the strip-cup is used regularly it usually reveals the first signs of impending trouble while clinical examination is also of value for a preliminary diagnosis. Any cow which is positive to either the strip-cup test or clinical examination may be strongly suspected of having contagious mastitis. Any cow which shows no clinical abnormality and which never gives any clots in her milk is not likely to be suffering seriously from mastitis infection. This does not mean that she may not be a carrier. Very many cows do harbour the organism and in large numbers, but never show visible signs or symptoms. The detection of these cows can only be done by involved laboratory tests which are, at least at the moment, quite impracticable on a large scale. These cows, though a source of much danger from the point of view of control, cannot be said to be suffering seriously from the disease themselves. This class of cow constitutes a serious problem which at the moment seems insoluble except in those few herds which are under complete control schemes.

Now I come to the development of control work on a wider scale. You may think that most of what I have said so far is, in popular parlance, defeatist and non-constructive. As far as eradication is concerned, this is true, but as to control I consider that a great deal of good can be done. The point is how to get a certain amount of good throughout all the herds, rather than the maximum of good in a few herds.

So to the scheme itself. Firstly, I must again emphasise that this is not, so far, a Government scheme. It is the suggestion of a technical committee consisting mainly of workers in the field of mastitis, including practical field control work, who have gone very thoroughly into the question, and reviewed all the angles in the light of the whole available knowledge and practical experience. I may say that a first essential of the scheme is the complete co-operation of the veterinary practitioner, the farmer, the Veterinary Investigation Officer, and the dairy advisory staffs, and I think I might quote a few points of the general preamble attached to the scheme as a start. These do not form part of the scheme itself but are purely explanatory and enable the other parts to be better understood. In this preamble it is stated, on the whole available evidence not only from this but also from other countries, that the following conclusions can be drawn :—

1. Segregation methods alone can seldom be relied upon to *eradicate* the disease, but it is generally agreed that the incidence and severity of the disease can to a great extent be *controlled* if adequate and consistent measures are taken to limit the spread of infection.

2. For this purpose action is required in at

least three directions: (*a*) improvement in the general hygiene of the herd, including adequate disinfection of premises and utensils (especially milking machines) and of the udders of milking stock and the hands of the milkers; (*b*) the adoption of improved methods of management, including the avoidance of over-stocking and of inefficient stripping; and (*c*) the segregation of heavily infected stock either in a separate milking shed or (where only one shed is available) at one end of the milking shed; the milking of clean stock before infected stock, and (where possible) the segregation of young stock from the milking herd.

I might add here in parentheses that in my view, based on 18 months in the field attempting to control this disease, these measures are, under present circumstances, merely delaying. They do not prevent ultimate infection of a free animal entering an infected herd, but they do delay that infection by reducing the amount of infected material and hence the risk of infection, so that the animal remains free longer and thus produces more milk than it otherwise would have done. To quote again:

3. In field trials carried out in this country the diagnosis of mastitis has invariably been made by plating on Edwards' crystal-violet blood agar. In other countries according to the workers concerned, apparently satisfactory control has, however, been secured by the use of less stringent tests, or even by the periodic clinical inspection of the herd. It appears, in fact, that the stimulation of the active interest of the individual herd owner and his intelligent application of the general principles noted above are at least as important as the accurate identification and isolation of infected animals.

4. This view is borne out by the results of recent investigations which indicate that the observed incidence of infection, as judged by bacteriological methods, depends on the delicacy of the diagnostic test employed. By enrichment methods, for example, many animals will be classed as positive which are negative when plated on crystal-violet blood agar. The plate test must, therefore, apparently be looked upon as an arbitrary rather than an absolute criterion of infection.

5. If these facts are accepted, it follows that, in formulating a national scheme as an emergency measure, it will be justifiable to adopt a less stringent test than plating on crystal-violet blood agar. The latter is time-consuming, involves the use of considerable glassware, and requires expert interpretation. It is therefore impracticable on a nation-wide scale. A number of alternative tests have been considered and there was general agreement that the strip-cup test, *if regularly applied*, should provide a sufficient basis for the procedure detailed in para. (2), *i.e.*, hygiene, management and segregation. This test is extremely simple, is inexpensive, and is capable in many cases of revealing the early preclinical stages of the disease. Moreover, it seldom gives false positives.

6. Apart from the general methods of control outlined above, we examined the results of an extensive series of experiments designed to test the efficiency under field conditions of two methods of treatment, viz., the oral administration of sulphanilamide and the injection of acriflavine into the udder.

In brief, the scheme would be based on (*a*) a widespread attempt to improve hygienic and management conditions in a large number of herds, using the strip-cup test as a basis for diagnosis, and (*b*) the provision of treatment under approved conditions to all participating herds.

The detailed proposals are outlined in two memoranda. The first of these deals with general points of hygiene, and is meant for the Dairy Staffs and for the farmers. Of course the veterinary practitioners would also have a copy so that they could explain anything to their farmers that the latter do not quite understand, though the whole thing is very simple. The general lines of the memorandum are as follows. (I will quote parts where necessary to give a coherent idea of the whole.)

It mentions the effect of udder diseases on the milk yields and also on the quality of the milk produced (this, incidentally, is a point often forgotten, but it is very important from the point of view of loss of milk products), and it gives the cause of mastitis, emphasising the importance of contagious mastitis due to *Str. agalactiae*. It points out that control and not eradication is aimed at, as the latter is impossible of attainment in present circumstances. It makes a point of the necessity of the farmer taking an interest in the hygiene of the cows and of the great importance of disinfection of utensils, byre, and attendants' hands, etc. It gives the factors predisposing to udder infection in detail, and I will quote this part:—

1. *Overstocking*.—This causes strain to the udder tissue and actually serves to suppress the yield. It is painful to the cow and lowers the resistance of the tissue to infection. Milking intervals must always be regular and the same order of milking maintained.

2. *Driving*.—Milking cows should never be hurried, harried or ill-treated in any way. It is particularly important to avoid such treatment shortly before milking, especially with cows having large or pendulous udders. Such cows are very likely to bruise their udders between the hind legs.

3. *Incompetent Milking*.—Milking and stripping by pulling, snatching or tugging stretches the teat and lower part of the udder, causing damage to the tissue.

4. *Inefficient Stripping*.—Inefficient or incomplete stripping may encourage infection.

5. *Use of Milking Machines*.—Great damage to the udder may be caused by using a vacuum which is too high. As many vacuum gauges are inaccurate they should be calibrated at regular intervals to determine the true pressure. The lowest vacuum consistent with speed and efficiency is always to be used and the vacuum should be constant. Moreover, it is very important not to allow the teat cups to remain on the cow after milking is completed. This is especially important where a change in pressure takes place when milk at the end of milking ceases to be lifted to the overhead conveyor pipe.

6. *Sores on Teats*.—Sores or cracks on the teats or udder should be regarded as serious and properly treated at once to avoid infection.

7. *Accidental Injury*.—Ill-designed or cramped standings, overcrowding of cows in a single line without partitions, slippery floors and dangerous gutters may result in injury to the teats by treading or rising. Barbed wire is well known to be dangerous to milking cows. Udder injury should always be regarded as a major event and treated accordingly. It should always be borne in mind that injury of any kind to the udder tissue may be and often is followed by an attack of mastitis.

8. *Soiled Litter*.—Litter soiled by milk residues either from rejected foremilk or otherwise is dangerous, as the organisms causing udder disease are thus disseminated and may infect other cows. For this reason every cow should be made to occupy its own stall on all occasions.

9. *General*.—Quietness in driving, milking and feeding are at all times essential. A fall in yield in any quarter is an indication of infection. The presence of lumps or indurations to be felt in the udder after milking are also evidence of infection.

The memorandum then gives the method of use of the strip-cup and emphasises the essential point of this method of testing, that is, that it must be used constantly and regularly. It is quite useless if used only irregularly. When clots are noticed a sample is to be taken and despatched to the laboratory for confirmation. In this memorandum it is left vague who is to do this, but in the second memorandum, to which I will come later, it is assumed that it will be done by the veterinary practitioner. Perhaps where he is unable to find time in a busy practice he will, in the case of many of his clients, leave them tubes for them to forward themselves and he will then be notified by the laboratory.

The memorandum then suggests the usual order of milking—heifers, free cows, lightly and heavily infected animals—and expresses the hope that if possible a separate shed will be used for the latter cases.

The use of disinfectants is then gone into in detail and the strengths of Chloros (the best disinfectant for this purpose) are given for each type of use. Perhaps I might quote this part, but before doing so I might mention that hypochlorite solutions are the best types of disinfectant for this disease, but it must not be forgotten that they lose their strength if not renewed after a fair amount of organic material has got into the pails.

(*a*) *Washing and cleaning the udder*.—2½ oz. Chloros (or other chlorine disinfectant of equivalent strength) should be added to each 2 gallons of washing water. 2 buckets of, say, 2½ gallons capacity are necessary, one containing two cloths for washing down the animals, the cloths being used alternately. The cloth not in use is left in the Chloros solution in the bucket. The second bucket contains two cloths for wiping and drying and these are also used alternately as above. The water in each bucket must be changed after cleaning 18 cows.

(*b*) *Disinfection of milking machine teat cups between milking*.—2½ oz. Chloros to 2 gallons of water. After milking a cow and before milking another (1) Rinse the cluster of cups in the bucket of clean cold water by plunging vigorously, mouths of the cups downwards, four times in five seconds. The vacuum must be turned off. Change this water after every three cup clusters have been rinsed. (2) Drain for 5 seconds. Dip into a second bucket of, say, 2½ gallons capacity containing Chloros solution, plunging three times in 4 seconds. (3) Drain, shaking the cluster for 3 seconds. Renew the Chloros solution after 28 cows.

(*c*) *Disinfection of milkers' hands*.—2½ oz. Chloros per 2 gallons water. After washing off the dirt rinse the hands thoroughly between the handling of each cow, when using the strip-cup, before milking, and also between strippings. You will notice that 2½ oz. of Chloros to every 2 gallons of water is the strength recommended for each of these purposes.

That is all there is in this memorandum. In the second, which more nearly affects us, the veterinary aspect is discussed. It is pointed out that the veterinary practitioner is already a busy man and can hardly be expected to add to his burdens by undertaking more educational work. It is therefore considered that the first steps would probably come from the Dairy Advisory Officer, who is constantly in touch with the farmers, through the various clean milk schemes, etc. He will explain memorandum 1, interest the farmer, and demonstrate the use of the strip-cup. The name of the farmer will be sent by the Dairy Officer to the Veterinary Investigation Officer, who will note it for record purposes and send the name to the general practitioner whose client the farmer is. The practitioner will then examine all the cows clinically and take samples from all he suspects. These are sent to the laboratory and examined for mastitis. The details of the tests are given but deal with purely laboratory methods.

The Practitioner's Role

Now we come to the most important part, that to be played by the general practitioner. This really is the most important because unless he maintains a constant vigilance his clients will tend to slip back into doing nothing. The part to be played by the general practitioner is twotold. Firstly, he is to examine the animals clinically and generally keep a veterinary eye on the herd, and secondly he is to treat the affected animals. So we come to treatment, and here I want to make a remark or two before going into details. The first is that the question of when the treatment should take place has been considered carefully, and it has been thought in the first instance that treatment in any herd should await the laboratory reply and only cases recorded as positive by them should be treated. Any of which the veterinary surgeon is still suspicious should be retested and then treated if positive. After the first general test of the herd any further cases will be those reported by the farmer or by the veterinary surgeon and it is thought that here the veterinary practitioner should have full discretion to treat at once if he considers it contagious mastitis. It is useless to treat other types of mastitis as neither of the forms of treatment advocated is of the slightest use against any type of infection other than *Str. agalactiae*. The only condition laid down is that a sample should immediately be sent to the laboratory so that a record can be kept to see if the treatment is of value. It is hoped that a further sample a week or two after the treatment will also be supplied for the same purpose. The two methods of treatment suggested are the use of sulphanilamide and acriflavine. The methods of administration suggested are (I quote from the memorandum) :—

(*a*) *Administration of Sulphanilamide*.—This drug is best used on cows in full milk. If the animals have only recently calved a full course of treatment is liable to affect the cow adversely and to prevent the full milk yield being subsequently attained. If, on

the other hand, the cow is approaching the end of lactation she may go dry permanently after a course of treatment, though this may, in many cases, be an advantage. As an added precaution treatment should be confined to only one or two cows in any herd which has not previously been treated, since the effect of the drug varies somewhat from herd to herd and in rare cases produces adverse symptoms without curing the disease. When a cow in full milk is treated the following doses are recommended. [These were worked out by Dr. Stableforth] :

First dose : 3 drachms per cwt. live weight.
Second and each subsequent dose : 1 drachm per cwt. live weight.

The drug should be administered every eight hours, being shaken up in water and given as a drench. It is not soluble. Should it be impossible to arrange for the three doses per day, two are of value especially if the doses are proportionately increased. Subsequent stripping, especially in acute cases, should be encouraged.

(*b*) *Injection of Acriflavine.*—This drug has proved of value when injected into the udder in a concentration of 1 : 10,000 in distilled water. Stronger solutions are dangerous. It is most valuable when used on cows which are drying off or actually dry. The technique has been fully described by Stableforth and Scorgie (*Vet. Rec.* **50**, p. 663 (1938)), but may be briefly recapitulated here.

Using the solution at just over blood heat, inject about 200 c.c. into the quarter. An enema syringe or a gravity method may be used (the latter for preference), with a fairly narrow teat syphon. ***Particular care must be taken to avoid injuring the teat canal.*** The first 200 c.c. is immediately stripped out and sufficient fresh solution is injected to bring the udder to easy milking tension. If the cow is not completely dry she should be stripped out after five minutes, again in 4 to 6 hours, and thereafter every 12 hours at milking. If dry, the solution may be left in the quarter for 24 hours and then stripped out.

Actually these details are to be elaborated somewhat before the final memorandum is sent out.

Although these methods of treatment do not give 100 per cent. satisfactory results, the mass of evidence so far indicates that the beneficial effect is considerable, especially in acute cases when up to 90 per cent. of the treated animals have recovered clinically, while we have found that about 40 per cent. of cows are bacteriologically cured for at least three months. But these results vary tremendously from herd to herd, and this is probably because both lines of treatment depend on the cow and unless the factors which caused her to go down are removed it is not the slightest use treating her, as even if she clears at the time she will go down again as soon as treatment is stopped.

I am afraid a good deal of repetition has occurred, but this was difficult to avoid and give as far as possible a coherent idea of the whole. It has all been said before not once but many times, but I think that at the present time it is worth taking the opportunity to ventilate the question once more, especially as there are the seeds of further development between the state and the general practitioner. Also it is an attempted advance in preventive medicine, a field which is likely to be much more widely developed in the future. That is my justification for talking to you about it.

In conclusion, I might add that any questions of inducements to the farmer, or terms of employment of veterinary surgeons, cannot be discussed here, as these are entirely matters for the Ministry of Agriculture.

. . . . .

Discussion

Mr. A. Gofton, who opened the discussion, expressed appreciation of the lucid way in which the subject had been put before the meeting. He agreed with Dr. Watts that with their present knowledge and the means at their disposal eradication was not possible. When Minett published his work on bovine mastitis, it was hoped that the problem of control had been solved, but field trials of the methods suggested on the basis of that work showed that this was not yet the case.

Dr. Watts had made it clear that as a practical working proposition Minett's method of laboratory diagnosis was too expensive and too prodigal of labour and time. To carry it out would entail laboratories in every county, which was outwith the sphere of practical politics under present conditions. Minett's view that *Streptococcus agalactiae* was an obligatory parasite had had to be abandoned as a result of more recent evidence, and his theories as to the method of spread of infection were not applicable in every case. In herds in which segregation had been tried, breakdowns sometimes occurred in the mastitis-free section for no apparent reason. Yet, when such animals were transferred to the infected group, they occasionally cleared themselves of infection and remained negative, although in the midst of heavy infection with no special precautions to prevent their being reinfected by their neighbours. Moreover, approximately 15 per cent. of heifers at their first calving when tested within ten days of parturition were found to be infected before admission to the herd, even with all precautions to prevent infection. It was obvious that a farmer trying to build up a clean herd and looking to his heifers for replacements was liable to considerable disappointment.

Because of present war conditions, the Mastitis Committee of the Agricultural Research Council had been trying to evolve a scheme which might help to reduce the ravages of mastitis and increase the production of milk, as well as limit the losses resulting from early casting of dairy cows. Dr. Watts had outlined the scheme whereby it was hoped to detect the earliest clinical manifestations and by a process of segregation, management and treatment to reduce and minimise the effects of the disease. The scheme was at present only in a preliminary formative stage, it might never materialise or it might emerge in a different form from that put before the meeting.

Dr. Watts had mentioned treatment with sulphanilamide and had suggested that it might be delayed until the laboratory diagnosis had been established. He (Mr. Gofton) would suggest that both from a psychological and a practical point of view, animals should be treated immediately clinical manifestations were detected. It would take about a week before the laboratory results would be received, and farmers would be inclined to think that if delay of a week in applying treatment did not matter, then treatment could not be of much importance.

Much could be said in favour of the sulphanilamide treatment as a means of clearing up clinical symptoms. It was the case that some cows appeared to clear up without treatment, but with sulphanilamide it was claimed that about 50 per cent. would also clear up bacteriologically. He was not in favour of treatment with acriflavine as a general routine. To produce good results, it required a great deal of care and attention and, if details were neglected, unfavourable results might follow. He thought that acriflavine treatment should be reserved for cases in which conditions were appropriate.

Very often cows harboured considerable numbers of the organism for a long time without developing symptoms. He emphasised that study of the conditions under

which the organism became pathogenic was essential. Teat injuries and teat sores were very important in this respect, for mastitis was frequently associated with primary injury to the teats. Excessive distension or congestion of the udder might also be predisposing factors, especially in first-calving heifers at parturition.

He was rather sceptical about the importance of herd immunity or family immunity, though considerable significance was attached to that aspect of the problem in some countries.

If the scheme was to have any value, they would have to make the farmer "mastitis conscious." They must emphasise that, by making an effort along the lines suggested, farmers would not only reduce the incidence of the disease, but also the great losses which resulted from reduced milk production and the premature casting of cows from the herd.

Mr. W. Nairn observed that, as Dr. Watts had said, the scheme was mainly educative and was not an attempt to eradicate mastitis. Previous speakers had emphasised the injury which the disease caused to the udder, but what really worried the farmer was the trouble he got into when his milk went for manufacture: his loss might be very considerable. In dairying districts there were more requests for help than in his own district where the disease was not so serious from an economic point of view. In Perthshire many of the cows came from Ireland with varying degrees of infection and many of the udders indurated. This probably accounted for many of the disappointments he had experienced with sulphanilamide treatment—either the treatment was too late in starting or the infection was a mixed one.

Everyone must have been struck by the observation, quoted by Mr. Gofton, that 15 per cent. of heifers were found infected at calving. He wondered whether the infection in such cases was due to injury.

The scheme, as indicated by the previous speakers, would throw a great deal of responsibility on to the practitioners, but they would be ready to undertake it if supplemented by essential laboratory services. It would be wise, however, to point out to owners of dairy herds that they must not be unduly optimistic. Disappointments would undoubtedly occur, but he felt that they had sufficient evidence to justify recommending the endeavour to deal with this scourge of the dairy industry. The improved methods of milk production which would result would not only be in the farmer's interest but also in the national interest, therefore he felt they should give it every support.

Mr. W. Wallace Peggie, having also thanked Dr. Watts for the stimulating address on a subject of such vast economic importance to the dairy industry, said that if, as Mr. Gofton had said, many heifers were found to be infected prior to calving, then eradication would seem to be almost impossible to attain, for the farmer would experience great difficulty in getting sufficient disease-free heifers to make good his losses in the main dairy herd. From what had been said it would appear that their knowledge of the disease was obviously still somewhat inadequate, and he was not quite clear whether the *Streptococcus agalactiae* might not be a saprophyte requiring the presence of secondary invaders before it caused the specific trouble, or a true pathogenic organism only requiring secondary stimulation. It did seem somewhat retrogressive tackling this problem along chemotherapeutic lines, and he would have preferred to work along definite bacteriological lines if they had had the necessary knowledge concerning the causal agent.

With regard to the use of the drug sulphanilamide in the treatment of streptococcal mastitis, he had obtained the best results by keeping up a fairly high blood concentration of the drug. He gave 2 oz. to 3 oz. straight away, and followed with 1 oz. doses every 4 to 5 hours according to the size of the cow. It was absolutely essential that treatment should start early in these cases, if any good result was to be obtained. He found that if they got no improvement within a week it was useless to carry on that treatment any longer. As this drug is only effective against *Streptococcus agalactiae*, its use in cases of mixed infection and indurated udders was a waste of time.

One point he would emphasise was that once the udder of a milk cow was actively infected with *Streptococcus agalactiae* the milk production from that particular lactation was gone; it might, however, return practically to normal at the next calving. He would agree, as had been mentioned, that abrasions and scratches on the teats were a fruitful source of a great deal of infection and, therefore, it was extremely important that all teat injuries should be properly treated at once.

Dr. W. S. Gordon expressed his appreciation of the able way in which Dr. Watts had explained the scheme and the difficulties which would have to be overcome in its practical application.

Obviously, their knowledge about the disease was by no means complete. At one time it was believed that the causal organism was an obligatory parasite. Now there was less confidence in that view and it was even being suggested that the organism might have a saprophytic existence in the mammary gland of some cows and was stimulated into pathogenic activity by such mismanagement in the herd as overstocking, savage milking, or injury to the teat or udder.

One of the main difficulties in the application of the scheme was that the farmer and his employees would want to know what benefits they might expect to derive from carrying out the arrangement. Could they be encouraged into wholehearted co-operation in the scheme by a confident statement to the effect that adoption of the methods recommended would bring clinical mastitis under control and produce a marked reduction in its incidence? He wondered if they had sufficient evidence for such an encouraging statement. He, personally, would feel much happier if they first tested the suggested methods under full-scale experimental conditions. For example, they might establish three groups of mastitis-free cows specially selected for the purpose and keep one group under the methods of management laid down by the scheme; the second group might be mismanaged in the various ways which were supposed to produce the disease, whilst the third group might have mismanagement combined with experimental udder infection by *Streptococcus agalactiae*. He would like to know the results of such an experiment before the scheme was launched on a nation-wide basis.

Mr. J. Andrew said that during the last 30 years in an extensive dairy practice he had often encountered streptococcal mastitis, especially since farmers started to eradicate tuberculosis from the herds. If an animal affected with mastitis gave a reasonable quantity of milk it was kept on so long as its health was not much affected although it was a menace to the herd—that was the state of affairs in 50 to 60 per cent. of dairy herds in his district.

He agreed with Mr. Gofton that there should be no delay in treatment or the golden opportunity would be lost. To get best results with sulphanilamide, treatment must begin early—it was useless with chronic cases. In early cases he gave half-a-pound of sulphanilamide in 12 hours and washed out the quarters with acriflavine; if a cow reacted to that treatment immediately, then she was worth treating. The strip-cup was, however, not infallible—he found that some cows gave a sort of deposit, white in colour, which one was liable to ascribe erroneously to mastitis. He remembered an unfortunate experience with a pedigree herd where the strip-cup showed a number of cows with such a deposit. He diagnosed the case as early mastitis and advised the farmer to get rid of the animals. They were then sold to the farmer's brother-in-law, and with the change of diet and atmosphere they cleared up completely. When the deposit was of a yellowish colour one had to treat it with grave suspicion.

One point which was obviously vitally important was to get the farmers with them, or the scheme would not be a success.

The President (Dr. J. Russell Greig) said that Mr. Andrew had raised two important points. In his experience it was apparently desirable to carry out treatment at once if the best results were to be obtained—that would mean cutting out the laboratory diagnosis. Also he found that the use of the strip-cup plus clinical examination was not infallible as a diagnostic method. It would be useful if other members could report their experiences on these matters.

Professor A. J. Clark (Pharmacology Dept., Edinburgh University) said that as a medical man he was diffident about addressing veterinary practitioners on such a subject. There were, however, one or two points to which he would like to refer.

In the first place, it might seem a retrograde step to substitute treatment for eradication, but they saw the same sort of thing occurring in relation to streptococcal infection of war wounds. It used to be assumed that infection got in when the wound was inflicted, but now Colebrook had shown that infection might be produced by hospital dust. Accordingly, hospitals were now using sulphanilamide to control the condition and to prevent dust-borne infection of open wounds. If the prevention of such infection by means of aseptic precautions was difficult in hospital wards, it was obviously impossible in an ordinary byre.

Sulphanilamide was of chief value in conditions where organisms were multiplying rapidly, and had less effect on smouldering infections. It was fortunate that cows were amenable to such large doses of the drug; apparently they could stand three times as large a dose (g/kg.) as humans. It would be wise, however, not to give too much in a single dose. The aim should be to maintain an adequate concentration of the drug for a considerable time.

Mr. Gofton observed, with reference to his previous remarks about prompt treatment of cases, that he had not meant that the laboratory examination should be cut out, but that the two should proceed simultaneously. The laboratory reports might explain failures in treatment when they showed that infection was not due to *Streptococcus agalactiae*.

Major D. S. Rabagliati expressed the indebtedness of the meeting to Dr. Watts for the lucid way in which he had outlined present knowledge of the treatment and prevention of mastitis. He felt that they were up against almost insuperable difficulties, but he had always been given to believe that difficulties were made to be overcome. One of the most important points was propaganda amongst farmers: how could they make a farmer feel that he would benefit economically by entering into such a scheme—for without this it could never be a success? It was, on the other hand, important to get a scheme going just now, for under the stress of war they needed every milk cow and every gallon of milk that could be got.

He thought that the difficulty of getting labour under war conditions had not been sufficiently stressed. Even if the farmer were made to become "mastitis conscious," how was he going to get sufficient skilled and interested labour to carry out the work which the scheme would involve? Labour was scarce and the type available was often much less skilled than it used to be. It would not be easy to find byremen interested enough to attend to all the details involved.

He did not think it would be unduly difficult to make farmers "mastitis conscious," and if that were once obtained they would have gone a long way. The speaker mentioned that he had been connected with an enquiry on sheep tick in the north of Scotland last summer and was struck by the result of propaganda. At one time the farmers took little or no interest in the tick, but, as the result of continued propaganda by those interested, there had been a great change and now the whole district was "tick conscious."

One point he would raise was with regard to the number of veterinary inspections that the scheme would involve. Would these visits be monthly or even more often? If a large number of herds were to be examined frequently veterinary practitioners would find it difficult to arrange always to be present at milking time, for farmers could not be expected to bring the cattle in frequently in summer if the examinations were numerous.

The speaker also mentioned that he had heard it stated that cows with loose teat sphincters were more liable to mastitis and he would like to ask Dr. Watts if in his opinion this was true. He also enquired as to whether the *Streptococcus agalactiae* was haemolytic; and if so, was it identical with the organism causing sore throats in human beings?

Mr. A. J. Kennedy agreed with previous speakers about the difficulty of eradication by segregation methods. For 18 months segregation of cows and heifers negative to *Streptococcus agalactiae* was carried out in a herd in his practice, consisting of 35 to 40 milking cows. During a year and a half 21 bacteriological negatives were found, but 13 of these became positives and mostly clinical cases. In spite of testing every two months and quite careful segregation of negatives, the herd was exactly the same in regard to the disease before and after the experimental period.

In regard to the practical application of the scheme, he wondered if veterinary surgeons could offer the farmers enough help to justify their coming into the scheme. How would it do to send round a leaflet stating what we, the veterinary profession, did know about the various factors, especially the predisposing ones, influencing the development of mastitis and then wait to hear what the general farming opinion was? Such a circular ought not to be a big one, and it might be circulated through the Milk Marketing Boards. They might explain simply what was really known for certain and give such useful advice as they could. If that was welcomed, then they might consider developing a scheme bringing in the veterinary surgeon.

He was not in favour of including treatment. To his mind it was unsatisfactory, and he thought they ought to concentrate on prevention of the disease.

For a farmer to get his herd clear would involve great efforts—greater probably than most farmers would be inclined to make at the present day.

Mr. H. M. Wilson said that a large amount of propaganda was obviously necessary, especially in districts like his own where dairying was a secondary consideration. He thought that they ought to approach the matter through the Dairying Associations.

He would like to have Dr. Watts' opinion on the milk test papers which were in common use. It seemed to him that they had a certain amount of value when combined with strict clinical examination.

Another question he would raise was as to the effect of feeding calves with milk from cows affected with mastitis. Had any work been done to see whether this did any harm? Were such animals more susceptible to mastitis when they grew up?

Dr. A. Cunningham (Advisory Officer in Agricultural Bacteriology, Edinburgh, and East of Scotland College of Agriculture) said he hesitated to address a veterinary audience on the subject of mastitis, but they might be interested to hear some account of the work they had been doing in the College of Agriculture and get some idea of their viewpoint, which was slightly different from that of the veterinary profession.

Their interest in the matter originated shortly after the publication of Minett's work on the possibility of eradicating mastitis by the method of testing and segregation. They had a considerable number of demands from dairy farmers for bacteriological assistance, and they felt they should try to determine what, if anything, was in the claim. Though they soon came to the conclusion that eradication was impossible, they had persisted with their experiments and amassed a fair number of results. He considered that it had not yet been proved that segregation could control the spread of the disease. Experimental work on segregation had been planned to test whether it was possible to eradicate the disease by this method. Such experiments were incapable of giving a

clear answer to the question whether control by segregation is possible.

With regard to methods of transmission, it was obvious that milking was not the only route. For example, a cow in the uninfected portion of a herd might develop the disease and before it was detected would occasionally have infected the cows on either side, not only the one after her in the milking line but also the one before her. If the method of segregation had been properly applied—and it must be assumed that it had, for most of their clients were intelligent and enthusiastic—then there must be some other method of transmission than by milking. Also cases had been noticed where it was the first cow to be milked in the mastitis-free group which became infected. It was clear that in such a case some other type of infection played a part. It had been suggested that the infection might persist on the hands of the milker for several days, but if so, this would make control by segregation well-nigh impossible.

His general impression was that while transmission of infection was important, it had been rather over-emphasised as compared with the question of resistance or susceptibility of the individual animal. In the majority of cases there were ample opportunities for infection and, therefore, the incidence of the disease generally depended on the individual resistance of the cows, which varied greatly. In every experiment they had found some cows negative at the beginning remaining negative throughout; others were infected at the beginning, and remained infected, whilst there was an intermediate group in which detectable infection fluctuated from time to time. That state of affairs could be explained by variations in susceptibility of the animals themselves. He knew of cases similar to those mentioned by Mr. Gofton, where an infected animal had cleared up and had remained clear whilst in the infected group. In addition, he knew of cases where a cow consistently free of infection had been placed by mistake in the infected group and had remained free, even although surrounded by massive infection. That could only be explained on the assumption that the animal had considerable powers of resistance. In their experience, also, treated cows almost invariably became re-infected some time after treatment, which seemed to indicate special susceptibility to the disease.

With regard to disease in heifers, in these herds about 16 per cent. of those examined had shown infection at the first test within three months of calving, but the distribution of these animals had been irregular, some herds having a high percentage, whilst one or two had none at all. In one particular herd, during each of the last two years as many as 30 heifers had been added and not one had shown infection at the first test, so that it was obvious that the infection of heifers varied from herd to herd. In that particular case they had inquired into the method of rearing and found that the calves were invariably reared on mastitis milk. It seemed, therefore, unlikely that this was a method by which the disease was frequently conveyed.

With sulphanilamide and acriflavine results were disappointing. Of 34 cows treated with sulphanilamide only five were cleared, and the majority of these became re-infected. Similarly, of 20 cows treated with acriflavine, six were freed for a period but became re-infected. Such results were markedly at variance with Dr. Watts' experience.

With regard to the suggested national scheme, he had no doubt that testing by strip-cup and segregation would reduce the amount of infection, but he would like to add his support to those who had counselled caution in regard to expectations. It was quite clear that if segregation experiments based on the best available bacteriological methods were unsuccessful, then any scheme depending for diagnosis on such a primitive test as the strip-cup did not appear to stand much chance, though, of course, it was necessary to remember one great advantage of the strip-cup, *viz.*, it could be applied twice daily, thus greatly increasing the chances of detection.

There were also practical difficulties with regard to segregation. Dairy people were not keen on it, as it involved continual movement of cows, which had an unsettling influence and reduced milk production. If cows had once stood long in a particular stall, it was difficult to get them to change, and the effort might even involve considerable injury to the animals. This was particularly so during the summer when the animals were at grass and had to be brought in twice a day.

Milking machines were another problem in segregation schemes. Thorough sterilisation was absolutely necessary, because the badly infected cows were milked last and the machine became infected, involving the risk of transmitting infection to the clean group at the next milking. With his experience of clean milk production he had no great confidence in the adequacy of sterilisation of the machines on many farms.

He was afraid that he had been somewhat critical, but his views were based upon experience, and he hoped they would be of some use in stimulating discussion.

Mr. J. P. Walker stated that he would like to know whether the *Streptococcus agalactiae* conformed with Koch's postulates. If not, it seemed that they were "barking up the wrong tree." Without fuller knowledge of the causal factor, it seemed that something along the lines indicated by Dr. Gordon was necessary. Judging from Dr. Watts' paper and the general information gleaned by the discussion, no practicable method of control was yet possible. To pass lightly over causal factors and proceed with a memorandum on treatment, control or eradication, however carefully compiled, was unsafe—they were building a castle on sand. The reports of practitioners who had tackled the problem were not encouraging. A crusade to make farmers "mastitis conscious" was a good thing, and that was what the practitioner had been doing ever since he attended his first milk fever case. But they must not hold out false promises. Let them try and find out more about the disease before formulating any scheme to put before a hard-headed body of men.

Sir Arthur Olver said the discussion was essentially one for those with practical experience of the problem, but he would like to thank Dr. Watts and congratulate him on his lucid exposition. Recently he had heard a discussion on this subject by the Survey Committee of the N.V.M.A. and it seemed to him that they were still at the stage when a great deal more information was required. So far these and other diseases had been dealt with largely on sporadic lines but, now that animals had become so valuable because of war conditions, he felt that the time had come to tackle these problems systematically. From his experience in different parts of the world, he felt that they required some animal husbandry organisation which could set on foot adequate researches and formulate suitable schemes of control, when knowledge became available.

Mr. Gofton had remarked that laboratory facilities could not be provided at present all over the country. That should not be the case in a community like ours. This country ought to be provided with all the laboratory assistance and organisation required for investigating problems of animal health and for assisting the practitioner to deal with them as they arose. Until they got those problems dealt with systematically by an organisation with the necessary funds, facilities and powers, the profession would not have an opportunity of showing what it really could do.

Mr. A. Brownlee felt that the paper, which was most interesting, had concentrated mainly on one aspect of the subject. There were, however, two factors concerned, the host and the parasite, and he thought far too much discussion had concentrated on the parasite. That, of course, was not to be wondered at as most of their knowledge was derived from research work on the associated bacteria; there was very little known about the resistance of the animal. He would stress the need for more research into methods of building up individual resistance before any scheme was formulated. There was need for more research, for example, into the feeding of the dairy

cow. One notable factor in milk production was the tremendous strain put on the digestive tract of the cow by feeding productive rations. They must try to find how to take some of that load off without interfering with the nutrition of the animal, keeping in mind that the rations now fed were often much greater than what the animal would normally ingest under natural conditions when only producing enough milk to feed its calf. He agreed with Mr. Walker that they must get down to bare facts before putting forward any scheme.

Mr. Nairn thought this question of infection by the milker was more important than many previous speakers realised. For example, apart from injuries mastitis was rare in suckling herds. He felt that this indicated that the calf was more hygienic than the milker or his appliances, and that the danger was, therefore, mainly on the human side.

Mr. Walker felt that Mr. Nairn was relying too much on the assumption that suckling was a cleaner and more hygienic method than hand or machine milking. Cows suckling calves were usually living under more natural conditions than the average dairy cow, which led them back again to the question of individual resistance. The same sort of thing could be seen with retained placenta—only in the cow living under unnatural and unhygienic conditions did it usually become serious.

The President said he was very gratified at the volume and character of the discussion, and he was very grateful to Dr. Watts for his paper, which had stimulated such a discussion. The various contributions had been recorded; they would be examined and collated and would doubtless prove of value when presented to the proper quarter.

The Reply

In his reply Dr. Watts said he agreed with all those speakers who wanted more fundamental work done. That was also the view of the workers concerned and work of this nature was being increasingly undertaken. If, however, all control was stopped till this work was completed it might be ten years before anything was done. It had been necessary to extend Minett's segregation method to a greater number of herds in the field in order to assess its value. The time so occupied had not been wasted, as many valuable results had been obtained and much greater knowledge of the practical difficulties in controlling this disease had been gained.

With regard to Mr. Gofton's remarks on methods of transmission he would also mention the recent American work which had shown that the ordinary house fly could transmit the disease. He agreed that early treatment was essential and this was incorporated in the scheme, which left the veterinary surgeon complete discretion as to treatment except in the first test. As the animals to be treated after this test would all be chronic cases detected by clinical examination or those suspected by the farmer, a little delay should not affect the result. He did not agree that infection of heifers was as high as 15 per cent.: he would have said 10 per cent. at the maximum. Also with regard to acriflavine treatment some practitioners had got quite good results with it (nobody claimed 100 per cent. success with any treatment) and he did not see why a technique apparently mastered with success by some should not be equally mastered by others. Family immunity, mentioned by Mr. Gofton, he included under the general heading of individual immunity, as this would depend on the ontogenic development of the individual.

Mr. Nairn had mentioned failures with treatment of cases where the udders were indurated and he agreed that once damage had progressed to such a stage sulphanilamide was unlikely to do any good. The most important part of the scheme was the change in management of the animals. The role of sulphanilamide was to hinder the development of the streptococcus and give the cow a chance to clear herself. If there was no response in about four days they should stop the treatment. Also, unless there was a change to a better system of management, re-infection would undoubtedly occur.

With regard to Mr. Peggie's question about the role of *Streptococcus agalactiae,* his own view was that it was neither a saprophyte nor a pathogen. He thought it might be regarded as practically symbiotic, having almost reached the position of living in the udder without doing any damage, but liable to multiply if the resistance of the animal were reduced. In that respect it was probably analogous to the streptococcus causing sore throat in man. The doses of sulphonamide recommended were adequate so far as present evidence went and from the clinician's point of view administration for about four days was usually sufficient. If no improvement was evident by the third to fourth day the drug could be discontinued, as it would probably be of no value.

Dr. Gordon had mentioned the importance of the farmer's interest. This was, indeed, of paramount importance: if the farmer lost interest all the work went for nothing. It was essential that the veterinary surgeon be diligent in keeping the farmer up to it and here he might answer part of Major Rabagliati's questions. It was considered that a veterinary surgeon could always call in at his clients' premises every two or three months and it was during these odd visits on other missions that the clinical inspection of the animals could be carried out. Mr. Kennedy's herd which did not respond to control measures had not cleared off many of the infected stock and had a bad milking machine, but a big factor might have been that Mr. Kennedy was not able to visit the farm during his absence on military service and when re-visited on his return it was obvious that some slackening of the segregation scheme had occurred, *e.g.,* at the time of the visit the infected cows were washed first and then the same cloth used to wash the clean section. Reverting to Dr. Gordon's remarks he agreed that self-contained herds were to be preferred; but he would not exclude the flying herds from participation. Even in these, measures of control were possible if the farmer was properly instructed, though segregation was not possible. He quite agreed with Dr. Gordon's demand for a large experiment on the fundamental factors of the disease, but this would require proper isolation blocks. They had been about to build a block for this purpose at the Hannah Institute but the war had prevented this materialising.

Mr. Andrew's experience of cows presumably infected clearing up on being sent to another farm, quite probably did not indicate bacterial cure but only clinical cure owing to the removal of the environmental factors which caused the symptoms to appear. On the second farm they were possibly better looked after and being only slightly affected ceased to show evidence of infection. In any case no one could claim infallibility for any biological test. Also Mr. Andrew pointed out that with him sulphonamide had not cured the cows. It could not be too strongly emphasised that this drug never did *cure* any cow. Its action was very definite. It decreased the rate of multiplication of the organism but did not kill it. Its inhibitory action had to be supplemented by the defensive mechanism of the animal and it was this that cured the case. Therefore, it was essential in treatment that the cow should respond actively to the stimulus of the germ and also that the factors causing her to show infection should be removed or be no longer operative. If neither of these two essentials was present then the drug failed to promote a cure.

Major Rabagliati had stressed the need of getting down to fundamentals, but under the present emergency conditions the Government were anxious to get quick results—they wanted to control the disease as much as possible so as to increase the supply of milk. He knew that labour was a difficulty, but the extra work envisaged by the scheme would not involve very much labour. It was the keenness and interest of the individual byreman which was important. This speaker had asked if it were possible to use the haemolytic reaction to differentiate between *Streptococcus agalactiae* and *Streptococcus pyogenes.* As a general rule the latter had wide zones of haemolysis and the former either a narrow one or was

non-haemolytic. There were, however, strains which gave wide zones and thus the reaction could not be used differentially.

Mr. Kennedy had urged the necessity of more propaganda. This it was hoped would be carried out by the Ministry, but that was for them to decide. More education of the farmer on the lines of Memorandum 1 was certainly a necessity. It was, as Mr. Kennedy had said, most essential that the byre attendants should be interested in the matter. Mr. Wilson's suggestion that milk testers might be employed on propaganda work had been considered, but it was thought that Dairy Advisory Staffs were probably in a better position to carry this out. There was no reason why milk testers should not be so employed, however; the more people talking to the farmer about it the better, provided they said the right things. With regard to infection in calves, attention was being paid to this and an experiment was in progress. It would, of course, take a number of years to get results.

Dr. Cunningham's experiences had been very disappointing. This speaker did not think control by segregation had been proved, and on that most people would agree with him, especially if this were qualified by the insertion of "under field conditions." He agreed with Dr. Cunningham that "mastitis consciousness" on the part of the farmer and general hygienic precautions as to hands and washing cloths were very important. As to milkers' hands harbouring the germ, this was not so serious if the hands were washed frequently in disinfectant. He was pleased to hear that Dr. Cunningham also agreed on the importance of the cow. The variations in the amount of infection in heifers found by Dr. Cunningham might be due to (*a*) feeding with mastitis milk (despite Dr. Cunningham's experience in the herd fed with heavily infected milk); (*b*) the amount of "honey" present in the heifer before calving and (*c*) the density of the fly population. Not enough was known, however, to enable one to give any definite reasons. Those suggested were just his personal view. As for Dr. Cunningham's bad results with treatment, Dr. Watts attributed this to the persistence of the environmental factors, as he had mentioned above. So far as the scheme was concerned, he thought that sulphanilamide would clear up the early cases, preventing the development of an acute attack and consequent loss of a quarter. He agreed with the practical difficulties of segregation, but the scheme would involve only the movement of the most heavily infected animals and this would not be a serious problem in the winter months, whilst in summer, with the cows at grass most of the time, it was not vital.

Mr. Walker had enquired if *Streptococcus agalactiae* fulfilled Koch's postulates. It could be said to do so. Mr. Walker wondered if there was any real evidence on which to base the scheme. The evidence was fairly definite and uniform. All reports agreed that though the scheme suggested by Minett had on the whole failed to eradicate or even in many cases appreciably to reduce the percentage of infection, there had in nearly every case been a considerable lessening in the losses from the disease. On the whole this lessening was in direct proportion to the trouble taken by the farmer and the attendants.

Sir Arthur Olver had urged what we all wanted—a very great extension of the preventive side of veterinary work. He also wanted more fundamental work to be carried out: there was no question of the necessity for this. Mr. Brownlee had emphasised the need for physiological work and for research on the effect of feeding. He was not qualified to speak on the physiological side, but that was bound up with the resistance of the cow, and this latter was the basis of the scheme. As to feeding, some experiments had been done in Germany in which they were not able to demonstrate any increase in infection in cows on a high protein diet. The question of diet was part of the more fundamental work still to be done, but the purpose of the scheme was to get the best results possible with the present knowledge and means at our disposal.

As regards the controversy between Mr. Nairn and Mr. Walker, it was possibly true that the lower the milk yield the less the risk of mastitis. If you were to keep up milk production mastitis would be present, and it was the purpose of the scheme to limit its incidence so far as possible. He was sure that if they got the farming community to co-operate and the veterinary surgeon was given a chance to treat early cases, the amount of loss from mastitis would be very substantially reduced.

CLINICAL COMMUNICATIONS

An Unusual Parturition Case in a Heifer

F. V. EDWARDS, M.R.C.V.S., AND
R. L. PHILLIPS, F.R.C.V.S.,
Loughborough

Subject.—Roan Shorthorn heifer, about two and a half years old.

History.—For some hours the farmer had noticed the animal straining, but had seen no water bladder. She was believed to have gone to full time.

Treatment.—One of us (R. L. P.), using all customary precautions regarding cleanliness, made a vaginal examination with difficulty. Just anterior to the *meatus urinarius* a fibrous membrane could be felt, which completely shut off the anterior part of the vagina from its posterior portion. Through this membrane a foot and the muzzle of a calf could be felt, but no foramen could be detected anywhere in the membrane.

Finding the thinnest portion of this "hymen," a finger was pushed through it, and then gradually it was broken down until a hand could just be introduced into the posterior part of the vagina. There was very little haemorrhage.

It was now decided to leave the heifer for a few hours, to see if she could bring the calf farther back. A very guarded prognosis was given.

Some five to six hours later, on being told by the farmer that a water-bladder "as big as a coconut" was showing and that she was paining strongly, the writer (F. V. E.) paid a further visit, and it was decided to attempt to calve her, as one foot and the head could be palpated.

No epidural anaesthesia was given, a customary procedure with all heifers in this practice, as it was felt that the heifer would assist if she pained.

Again carrying out the usual precautions regarding cleanliness, a snare was first placed over the calf's head. A further snare was then placed on the right fore limb, located farther back, and finally a snare on the left fore limb.

Steady traction was now applied alternately on all three points, paying particular attention to head traction and using only one man to each snare. Extensive soap lubrication of the calf was used throughout. At no time were pulleys resorted to.

After gentle manipulation, a large dead calf, weighing 102 lb., was finally delivered, the only damage to the heifer being some slight bruising, and two small tears in the mucous membrane, each about 1½ inches long.

The cleansing was removed at the same time, a pessary inserted, and the vagina dressed out. A stimulant was given, and the heifer was left lying comfortably on her brisket.

When last seen, she could get up and down easily and was eating well. Pulse and temperature were only slightly elevated.

An interesting note, supplied by a farm hand, is that for six to seven days after she was served, she was seen to be going about with her back arched and straining.

No attempt is made to suggest how she became fertilised, and as to whether the hymen was not completely imperforate or the bull punctured it at service is hard to say.

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Caesarian Operation in the Cow

C. D. JAMES, M.R.C.V.S.,
Bicester, Oxon

Subject.—A pedigree Guernsey heifer which the owner had expected to calve the previous week. The animal had shown a good bag at that time and had been uneasy but gave no other indication of calving.

Examination.—On October 8th, 1940, I was called to examine this animal. It was now off its food and emitted a putrid smell. I found the vaginal passage would just admit one's hand but the cervix would admit only one finger. Considerable physical manipulation dilated this to admit two fingers but no further dilatation seemed possible. One limb could be touched just inside the cervix—this was found to be putrid and was eventually severed by torsion—but no further embryotomy seemed possible.

I formed the opinion that the foetus had been dead seven to ten days and that possibly the *os* may have partly dilated seven days ago but had since closed, no doubt some malpresentation having occurred. The uterus was very septic. The animal was not in any condition suitable for casualty slaughter.

I decided to delay matters for a few hours—meanwhile, cloths, knives, etc., were sterilised by boiling. The animal was re-examined five hours later. There was no change in the situation. There were no labour pains.

Operation.—A Caesarian operation was decided upon and was undertaken with the assistance of the farmer and one farm hand, as described below :—

At 3 p.m. 1½ ozs. chloral hydrate in 1 quart water were given as a drench. The right loin and flank were clipped, shaved and swabbed with spirit. At 3.15 p.m. I was about to cast the animal when she went down. The legs were, therefore, roped together, 1 oz. of chloroform was given by mask, air restricted by a thick sack. At 3.25 p.m., with a large cloth in position surrounding the site of operation, 15 c.c. of 5 per cent. chlorocain solution were injected into the skin at the operation site. The skin incision was 12 inches long, commencing high up in the loins, and proceding dorso-ventrally. Haemorrhage was very slight. The muscles were then incised separately in a similar fashion ; the slight haemorrhage was arrested by forci-pressure. A further ½ ounce of chloroform was now given. The peritoneum was then grasped and withdrawn into the wound and incised for about 12 inches. This incision was not directly underlying the primary incision—and was achieved by retracting the peritoneum gently into the wound before incising it. The pregnant uterine horn was easily located but could not be withdrawn without the assistance of the farmer, who, by pressing his knee deep into the cow's flank (at the site of ballottement), pushed the foetus towards the spinal column. The pregnant horn was drawn into the abdominal wound as far as possible. Large cotton-wool swabs were placed around and the uterus was opened on its dorsal aspect for about 8 inches. This was done by cutting on to a foetal leg which could be felt. A large amount of septic fluid, foetal hair, etc., escaped and was swabbed up as far as possible. The foetus was then withdrawn through the incision. It is very probable that at this stage some infection reached the peritoneal cavity.

The uterus was then swabbed out with cotton wool, the incision then being closed by Czerny-Lembert sutures using boiled twisted silk. The peritoneum was sutured using interrupted sutures about 1 inch apart. No gut was available so silk was used. The muscles were sutured separately, using thick silk ; finally the hide was sutured with tape, this being the most difficult part of the operation owing to the toughness of the skin.

The wound was dressed with Dettol and tincture of iodine, then covered.

The prognosis was bad. (The operation took 45 minutes from commencement of chloroform administration.) Two ounces of sulphonamide (Evans) were left to be given as a drench when the animal got up. The owner reported that this occurred six hours later.

Course.—When examined next day the cow's temperature was 103° and it had eaten a little kale. A further 2 ozs. of sulphonamide was given in the evening. On the following day the temperature was 102·5, vulval discharge was observed and the patient was feeding. The womb was palpated and gently massaged *per rectum.* A pessary was inserted *per vaginam* and the vulva washed down. The wound was dressed with tincture of iodine. That night the animal gave a good quantity of milk and later, breaking out from her box, grazed with the herd. On the sixth day the temperature was 102°. The skin wound had healed and the majority of skin sutures, appearing loose, were removed—the animal was allowed out for two hours daily. About the thirteenth day the owner rang up to report that the cow was not so well. Examination revealed a temperature of 104° with pain and swelling at the lower extremity of the skin wound. The skin was re-opened for 2 inches and a stitch abscess located in the oblique muscles. This was thoroughly curetted, then dressed with iodoform and boracic, being subsequently irrigated daily for ten days by the farmer, using salt and water through an enema syringe. The few remaining skin sutures were then removed.

Subsequent recovery was uneventful. The owner tells me that the animal became savage for two or three days about one month after the operation, but now has become quite normal and is milking fairly well, the wound being barely discernible.

I think this case, though isolated, indicates that the advent of sulphonamide enlarges the scope of large-animal surgery under farm conditions, even more so to practitioners who are able to accommodate large animals at their surgeries, though one must, unfortunately, consider the economic aspect when deciding upon major operations of this description.

The serious effect that the reduction in the poultry population was having on the maintenance of high-quality breeding stock was referred to at a meeting of Rutland and Stamford F.U. It was declared that it no longer paid to rear for stock purposes, as there was no demand.

ABSTRACTS

[THE USE OF LARGE DOSES OF SULPHANILAMIDE IN THE TREATMENT OF CHRONIC STREPTOCOCCAL MASTITIS. (Second Report.) Miller W. T., Murdock, F. M., and Heishman, J. O. *J. Amer. vet. med. Ass.* **95**. No. 749.]

Following encouraging results with the use of sulphanilamide in the treatment of two cases of chronic streptococcal mastitis, the experiment was repeated with another four cows. Each cow received an initial dose of 0·4 gramme per kg. bodyweight followed by half this dose every twelve hours. A concentration of 20 mgm. per 100 c.c. of milk was aimed at, and it was found that this concentration could be maintained by administering slightly smaller doses of sulphanilamide towards the end of the course, which was maintained for six days.

One cow died on the fourth day of treatment. Autopsy revealed Johne's disease which was confirmed bacteriologically. The other cows showed some loss of weight, a temporary reduction in milk yield and a variable rise in temperature after discontinuation of the drug.

Samples of milk taken each morning were examined bacteriologically for *Str. agalactiae*. Immediately after the initial dose these organisms were absent from all samples. In one cow they continued absent throughout treatment, but reappeared when treatment ceased. In the second case (apart from the sample immediately after the second dose) the organisms were present throughout treatment. In the third case organisms appeared regularly throughout, and were present after the course of treatment was completed.

S. L. H.

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[THE ACTION OF SULPHANILAMIDE ON MASTITIS STREPTOCOCCI *IN VITRO*. Heishman, J. O., and Miller, W. T. (1940.) *J. Amer. vet. med. Ass.* **96**. 755, 176-179.]

The authors tested the resistance of four strains of mastitis streptococci grown in culture media to varying concentrations of sulphanilamide. The media used were plain infusion bouillon, serum (horse) infusion bouillon and skim milk. The survival of five strains of streptococci in plain infusion broth containing various concentrations of sulphanilamide at different temperatures for 72 hours was also studied. The strains of streptococci used were isolated from cows suffering from chronic mastitis with the exception of one strain which was sent from England.

Results showed that some strains of Group B (Lancefield) streptococci of bovine origin could survive concentrations of 800 mg. sulphanilamide in 100 c.c. for 14 hours at 38·5° C. As the temperature of the medium was increased the bactericidal action of sulphanilamide was enhanced.

No correlation existed between *in vitro* and *in vivo* results. For example, four strains of streptococci were equally susceptible to the action of sulphanilamide and failed to survive a concentration of 5 mg. in 100 c.c. for 72 hours. When a concentration of over 20 mg. of sulphanilamide was maintained for five days and more, in the blood and milk of the cows from which these strains were obtained, only one cow received any benefit and was found to have been entirely cured. D. W. M.

[GROUP SIMILARITY OF ALPHA HAEMOLYTIC BOVINE MASTITIS STREPTOCOCCI FOR LANCEFIELD'S SEROLOGICAL GROUP C. Little, R. B. (1939.) *Proc. Soc. Exp. Med. Biol.* **41**. 254-255. (4 refs.).]

A serological study of 15 strains of *a*-haemolytic mastitis streptococci of Minett's Group II (*Str. dysgalactiae*) has shown that all possess an antigen which gives a group-specific precipitin-reaction with sera of Lancefield's serological Group C. Furthermore, the group-specific antibodies in Group C sera are removed by absorbing with Group II mastitis strains. Specific antisera of the latter organisms are precipitated by extracts of haemolytic strains of Group C. It is concluded that strains of *a*-haemolytic mastitis streptococci (Group II) are either related or actually belong to Lancefield's serological Group C.

D. D. O.

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[INFLUENCE OF CULTURED TISSUE FRAGMENTS ON SULPHANILAMIDE INHIBITION OF BETA STREPTOCOCCI. King, J. T., Henschel, A. F. (1939.) *Proc. Soc. Exp. Med. Biol.* **41**. 220. (4 refs.).]

The inhibitory effect of sulphanilamide upon β-streptococci was studied *in vitro* in cultures of heart, skeletal muscle, liver and brain derived from 10- to 14-day chick embryos. In each case the characteristic effects of the drug were markedly inhibited by the products of tissue breakdown. This phenomenon was most obvious in heart and skeletal muscle cultures, less in liver cultures, and least in brain cultures. The pharmacological significance of such an observation is clear.

D. D. O.

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[HORMONAL INDUCTION OF ABORTION. Snyder, F. F., Koteen, H. (1939). *Proc. Soc. Exp. Med. Biol.* **41**. 2. 432-434. (4 refs.).]

Following earlier work which demonstrated that during the last trimester of pregnancy the duration of gestation could be profoundly altered by the induction of ovulation with extract of urine of pregnant women (Antuitrin S), experiments were initiated to determine whether or not pregnancy could be interrupted by a similar operation during the second trimester of gestation. A series of rabbits was injected at 11 and 17 days after the onset of pregnancy with 10 rat units of Antuitrin S. The duration of pregnancy in controls averaged 32 days. In the group of twelve rabbits injected eleven days after mating pregnancy continued uninterrupted to full term. In the group of 28 rabbits injected after 17 days early interruption of pregnancy occurred in 18 animals. In all of the remaining ten rabbits there were many dead foetuses, and the presence of fresh corpora lutea was demonstrated microscopically in every case except two.

D. D. O.

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[ACETONAEMIA IN SWINE. Hull, F. E., and Nolan, A. F. (1940.) *J. Amer. vet. med. Ass.* **97**. 162-164.]

The authors state that a review of the available literature leads them to believe that swine are particularly resistant to the production of ketogenic bodies. They quote three cases of sows and gilts fed on substances such as yellow corn and tankage, or yellow corn and coal ! It is hardly to be wondered at that the animals concerned showed symptoms of posterior

paralysis, unsteady gait, and the usual picture one associates with faulty nutrition. In the first case a total ketone content of 96·5 mg., of acetone per 100 c.c. of urine was found. Serum from clotted blood in the heart contained a total ketone value of 12·4 mg. of acetone per 100 c.c. of serum. A definite hypoglycaemia existed in this case, as evidenced by a glucose content of 20·3 mg. per 100 c.c. of serum. In the second case the urine obtained from the bladder gave a marked positive reaction to the Ross test for acetone bodies, the amount being insufficient for a quantitative analysis. The serum filtrate gave a ketone value of 35 mg. of acetone per 100 c.c. serum. Urine from the third case gave a three plus reaction to the Ross test, had a *p*H of 6·0 and contained 20 mg. of albumin per 100 c.c. Tables are given showing serum analysis and urine examinations.

D. J. A.

REVIEW

[FIRST AID TO DOGS AND CATS. By Maurice Harvey Clarke, M.R.C.V.S. pp. x + 145. 52 illus. Price 3s. 6d., post 3d. Published by Baillière, Tindall & Cox, 7 & 8, Henrietta Street, London, W.C.]

We have perused with interest the handy little volume entitled " First Aid to Dogs and Cats," by Maurice H. Clarke, M.R.C.V.S. It should prove particularly useful to, among others, canine nurses, kennelmaids, and those who have volunteered their services for animals as first aid workers. The pity is that the book was not in print a year ago when so many intensive courses of instruction were being given in the treatment of war casualties. But a great number of those who took such lectures will no doubt be only too pleased to acquire a concise and permanent printed record of first aid procedure, for handy reference at all times. A pleasing feature of the work is the inclusion of a descriptive preamble of each physiological system before proceeding to description and treatment of the accidental abnormalities of those systems. For instance, we find that preceding the discussion of fractures there is a 14-page discourse upon the normal skeleton ; similarly the circulatory system is explained before the author deals with haemorrhage and its methods of arrest, etc. The work is very clearly presented, legibly printed and well bound in a linen cover ; it does the author and publishers alike great credit.

IN PARLIAMENT

The following are among the questions and answers recently recorded in the House of Commons:—

Children's Overseas Reception Scheme

Major Braithwaite asked the Under-Secretary of State for Dominion Affairs whether he has any statement to make on the Children's Overseas Reception Board Scheme for 1941?

Mr. Shakespeare: As announced in the Press on October 3rd, the Children's Overseas Reception Scheme was suspended owing to the dangers to which passenger vessels were exposed. In present conditions it is obviously undesirable to resume the evacuation of children overseas, but, as soon as circumstances permit, a further statement will be made.

Scientific Advisory Committee

Captain Plugge asked the Lord President of the Council whether he can arrange for the newly-appointed Scientific Advisory Committee to review the adequacy or otherwise of the scientific appointments to the various Government Departments, including the permanent scientific advisory personnel and the personnel of the various scientific committees which advise Departments, with a view to ensuring that the fullest use is being made of scientific knowledge in the administration of the national war effort?

The Lord President of the Council (Sir John Anderson): The purpose which the Government had in view in establishing the Scientific Advisory Committee was " to ensure the continuance of the fullest co-operation of scientific workers with the Government in the national war effort," and one of the functions specifically assigned to the Committee is to advise on the selection of individuals for scientific work in, or for, the various Government Departments. I think, therefore, that the object indicated by my hon. and gallant Friend is already sufficiently met.

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Foreign Exchange (Payments in the United States)

Mr. Salt asked the Financial Secretary to the Treasury whether he is aware that the Bank of England is refusing applications for sufficient foreign exchange to enable British subjects to continue their annual subscriptions to American learned technical and scientific societies; and whether arrangements can be made to enable such small payments to continue to be made, having regard to the value of the connections involved?

Captain Crookshank: It is not the present practice of the Bank of England to refuse applications for reasonable amounts of dollars in respect of subscriptions to recognised American learned, technical and scientific societies. If my hon. Friend has any specific case in mind, I should be glad if he would let me have particulars.

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Medical Services (Post-War Reconstruction)

Sir E. Grahame-Little asked the Prime Minister whether his attention has been drawn to the formation, by the British Medical Association, of a medical planning commission to consider problems of reconstruction and reorganisation in the field of medicine in the post-war era; and whether, in view of the complexity of these problems and the importance to the public as well as to the medical profession of such reorganisation, he will consider the desirability of appointing a Royal Commission to conduct this inquiry with the ultimate purpose of appointing an independent Government Commission to regulate this reorganisation, in place of an individual and unofficial medical association, whose recommendations could not command the general assent which would be accorded to a Government inquiry?

The Prime Minister: I am aware of this inquiry by the British Medical Association, and of similar inquiries by other bodies interested in the medical and hospital field. They will no doubt afford a useful addition to the abundant material available, in the reports of Commissions and elsewhere, when the opportunity of reconstruction comes. I do not think that the appointment of a Royal Commission would, in present circumstances, be opportune.

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Oats (Rationing)

Colonel Carver asked the Minister of Agriculture whether he can give an assurance that, in connection with the rationing of oats for horses, an adequate supply will be made available for breeders of horses other than strictly agricultural horses, in order to ensure that this essential industry is maintained?

Mr. Hudson: Rations allowed under the present proposals for stallions and mares kept for breeding are adequate to allow the continuance of breeding.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Feb. 6th.—Central Veterinary Society: Council Meeting 11 a.m.; Annual General Meeting 12 noon; Ordinary General Meeting 2 p.m.—all at the Palmer Hall, West Street, Reading.

Feb. 12th.—Meeting of the West of Scotland Division, N.V.M.A., at Glasgow, 2.30 p.m.

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National Veterinary War Relief Fund

The gift of £1,000 made to the Victoria Veterinary Benevolent Fund by the National Veterinary Medical Association has been credited to a special account to be called the National Veterinary War Relief Fund. It will be administered by a Joint Committee composed of representatives of the Victoria Veterinary Benevolent Fund and the National Veterinary Benevolent and Mutual Defence Society.

It is intended that the money shall be used for the purpose of giving temporary financial assistance to members of the profession who have suffered the loss of their practice owing to enemy action.

Any member of the profession who is in need of financial help of this kind should send full particulars to the Secretary of the Fund, Dr. F. Bullock, at 18, Victoria Avenue, Harrogate, and the matter will then immediately receive the attention of the Joint Committee.

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Telephonic Communication

Members who are experiencing difficulty in making calls to their clients, or whose clients find it difficult to communicate with them by telephone, are asked to send full particulars to The General Secretary, N.V.M.A., 10, Bore Street, Lichfield, Staffs, *without delay*. This information is required to support representations which have been made to the Postmaster General.

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The Veterinary Record: Advance in Day of Publication

Complaint has reached us from many readers that, in consequence of postal delays, their copies of the *Veterinary Record* do not reach them until Monday morning or even later, and they are thus deprived of the opportunity of reading the journal over the week-end. With a view to rectifying matters in this respect, it has been decided by the Editorial Committee to advance publication by one day.

Inasmuch, therefore, as our press day now becomes Wednesday, correspondents and those who wish to make use of our small advertisement columns are advised that the latest time for the receipt of communications for which insertion in the next issue is desired is first post on the Tuesday preceding publication.

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Readers of the *Veterinary Record* will have noted that the alignment of type in recent issues has been very irregular. Our printers assure us, however, that the requisite steps have been taken to effect an improvement and that this may be anticipated shortly.

Register of Veterinary Surgeons

The Registrar of the R.C.V.S. reports that letters sent to the under-named members at the addresses given have been returned undelivered by the Post Office. Notices have been sent to each of these members as required by the Veterinary Surgeons Act, and as no replies have been received, their names are liable to be removed from the Register.

If any member can supply any of the addresses wanted, it will be a great help to the Registrar. The information should be sent to him at 18, Victoria Avenue, Harrogate.

Name.	*Last known address.*
Bradley, G. L. ...	14, Glenlock Road, N.W.8.
Budge, J. W. E. ...	Winton, Goldthorne Hill, Wolverhampton.
Custance, H.	Rowley Fields, Leicester.
Gale, F.	Grove House, West Wellow, Romsey, Hants.
Hind, J. H.	East View Terrace, Winthorpe, Skegness.
Jarratt, W. F.	Pondtail Bridge, Fleet, Hants.
Llewellin-Evans, T. G.	11, Langbourne Mansions, Highgate.
Malone, J.	High Street, Honiton, Devon.
Paul, Capt. H. Mc. B.	30, South Parade, Northallerton.
Smith, W. F.	Ferndale, St. James Park, Brechin, Angus.
Stokoe, R.	Kimbolton, Hunts.

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PERSONAL

Birth.—At Old Croft Home, Carlisle, on January 18th, to Mary, wife of J. K. S. Elmslie, M.R.C.V.S., "Cadnant," Newby West, Carlisle, a son.

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Forthcoming Marriage.—The engagement is announced between Cadet Peter Henry Hobbs, M.R.C.V.S., Royal Artillery, younger son of the late Mr. F. C. Hobbs, M.R.C.V.S., of Newport, Mon., and Mrs. Hobbs, now of St. Neots, Hunts., and Dorothy Thomas, younger daughter of Mr. and Mrs. E. Thomas, of Luton, Beds.

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Marriage.—Simpson—Henderson.—On November 9th, 1940, at St. Mary's Church, Kabete, Kenya Colony, Alexander Bedell Simpson, Colonial Administrative Service, Northern Rhodesia, to Ruth Mary Henderson, B.V.Sc., M.R.C.V.S., of the Veterinary Research Laboratory, Kabete.

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R.C.V.S. OBITUARY

Mr. F. L. Clunes, M.R.C.V.S.

Mr. Frederick Lawrence Clunes, whose death we recorded with much regret in our last issue, was well known throughout the city of Hereford and the county as a veterinary surgeon and prominent figure in the hunting world, and the *Hereford Times* says of him: "He will be much missed by a very wide circle of acquaintances which the practice of his profession and his sporting interests helped to bring him.

"It is over 20 years since Mr. Clunes came to Hereford from St. Austell, Cornwall, entering into partnership with the late Mr. J. L. Barling, veterinary surgeon, of King Street, on November 1st, 1920. Since the death of Mr. Barling in April, 1921, he had himself carried on the business, which was practised throughout the county and adjacent districts. Apart from his business he served various organisations in an honorary capacity as veterinary surgeon, and for years he so acted as one of the honorary veterinary surgeons at the Herefordshire Steeplechases held at Hereford on Easter Mondays. He was keenly interested in the work of the Royal Society for the Prevention of Cruelty to Animals.

"While frequently to be seen, when time would allow, enjoying a day's hunting with other packs in the county, Mr. Clunes was particularly closely interested in the fortunes of the North Herefordshire Hunt, and he had been a member of the Committee of that Hunt for many years. Until the state of his health compelled him some time ago to give up the pastime he was a keen golfer, and he was a member of the Herefordshire Club for many years. For several years he had been Chairman of the Hereford and County Kennel Society. It is interesting to recall that he was elected a member of the Council of the Hereford Rotary Club on its formation in 1930."

During the Great War Mr. Clunes served in France for some years as an officer of the Royal Army Veterinary Corps, holding the rank of Captain (Temporary Major) at the conclusion of hostilities.

The funeral took place at Hereford Cemetery, the Rector of St. Nicholas (the Rev. H. L. Ingham) officiating.

In the congregation were the Mayor of Hereford (Mr. H. P. Barnsley), Mr. J. R. Barker, M.R.C.V.S., Dr. A. J. Wilsdon, M.R.C.V.S., Lt.-Col. J. Scott Bowden, M.R.C.V.S. (Colwall), Mr. Corner (representing Mr. J. V. S. Rutter, M.R.C.V.S.), Mr. C. Franklin (representing the Hereford Rotary Club), Mrs. I. M. Wilmshurst (representing, as Hon. Secretary, the Hereford and County Kennel Society), and a number of persons well known in Herefordshire hunting circles, including Flying Officer Brooke Joynson (a former Master).

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ERADICATION OF BOVINE TUBERCULOSIS FROM THE UNITED STATES

The following note, in *Veterinary Medicine* (December, 1940), published under the heading "Exit Bovine Tuberculosis," illustrates the most gratifying achievement now to be recorded in the eradication of bovine tuberculosis in the U.S.A.

"The federal-state tuberculosis eradication project happily became history November 8th with the certifying of the last remaining counties, Kings and Merced, California, as modified accredited tuberculosis-free territory.

"This bovine tuberculosis eradication project initiated 23 years ago constituted the most gigantic animal disease control project ever undertaken in any country. More than 232 million tuberculin tests were made in its prosecution—an average of more than ten million tests a year. Altogether more than 4,000,000 reactors were taken out of the herds to which they belonged and were slaughtered.

"It should not be lost sight of that bovine tuberculosis was eradicated by veterinarians. Every step of the way the job was supervised and handled by men trained scientifically in the methods of handling animal disease. Despite much pressure, political and otherwise, professional work was kept in professional hands, with a result that the plan suffered no setbacks. Contrasted with the bungling that has characterised hog cholera control from its inception, tuberculosis control becomes a shining example of the competency of the experts and the futility of the uninformed in attempting to solve a problem as complex as disease control.

"Now a new project, that of avoiding a recidivation of the disease among our herds, automatically comes into operation. The new project must not be allowed to languish. The tubercle bacillus is a formidable foe. Because it has been vanquished once it must not be taken lightly."

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FOOT-AND-MOUTH DISEASE

Following the outbreak of foot-and-mouth disease near Derry, an outbreak has been confirmed at Birdstown, Co. Donegal, near the Innishowen-Derry border. A suspected case is reported from Carrigans, also near the border. On the Six-County side a third case was confirmed at Killymillaght, near Cullion, Co. Tyrone.

On this side, the disease was discovered in one of the Irish cattle which have been under constant observation at Merklands Wharf, Glasgow, since the outbreak of foot-and-mouth disease in the Londonderry district, when the order was made prohibiting until further notice the landing in Great Britain of cattle, sheep, pigs and goats from Eire, Northern Ireland, or Isle of Man. On Sunday last the existence of the disease was confirmed among cattle near Chippenham, Wilts.

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Further evidence of the serious and widespread nature of this visitation was forthcoming on Tuesday, when outbreaks of disease were confirmed at Breinton (Herefordshire), Skenfrith (Monmouthshire), and Smallwood (Cheshire).

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LEVERHULME RESEARCH FELLOWSHIPS, 1941

The Trustees invite applications for (i) Fellowships or (ii) Grants in aid of research. The Fellowships or Grants are intended for senior workers who are prevented from carrying out research work by routine duties or pressure of other work. They are limited to British-born subjects normally resident in Great Britain. In exceptional circumstances the Trustees may waive the condition as to residence. The Trustees are also prepared to consider applications from groups of workers engaged upon co-operative programmes of research—particularly from those engaged upon long-distance programmes or in institutions in which the normal facilities for research have been curtailed by the war. The duration of the awards will not normally extend over more than two years or less than three months and the amount will depend on the nature of the research and the circumstances of the applicant.

Forms of application may be obtained from the Secretary, Dr. L. Haden Guest, M.C., M.P., Leverhulme Research Fellowships, Kingscote House, 1, Watergate, Blackfriars, London, E.C.4. Applications must be received on or before March 1st, 1941. Awards will be announced in July and will date from September 1st, 1941.

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MINISTRY OF AGRICULTURE NEWS SERVICE

Care in The Barn

Corn Merchant's Tips on Fodder Storage.—Storing fodder is an important matter in these days. A large part of the extra 2,000,000 acres brought under the plough this year went into oats and other crops that make excellent feed for livestock and it would be all wrong to sell immediately after threshing and have to buy back from the corn merchant at his price, or even risk not being able to buy at all. But it would be an even worse tragedy if grain were spoilt by damp or wasted on unrationed meals for rats. Some useful tips on storage were recently given in a broadcast talk by Mr. W. G. Phillips, a well-known west of England corn merchant.

After a summer like last, the grain, with a little care in the barn, should come to the cattle through the winter almost as full of the sun as when it was stacked. But grain is alive, and it must be allowed to breathe, and sleep, so that its valuable vitamins are preserved. If it is stacked in damp and airless conditions it will malt and die without obviously changing its appearance, but with an enormous loss in food value.

Most farmers store their grain in sacks. The first thing is to tie the sacks tight down and get them of even size. Keep the sacks away from the barn walls by nailing some quartering around the barn about 18 in. and 3 ft. 6 in. from the floor. Stack up in tidy rows from front to back, two or three high, and leave an air space between the rows, with a space wide enough every five or six rows to let the farm cats get around. Keep the barn well ventilated on fine days by opening up the doors, but keep them shut in damp, muggy weather. If work on the farm allows time during the winter, take down the stack and set it up with the top sacks going to the bottom and turned upside down. The more the grain is moved the better. Farmers fortunate enough to have bins should draw out a few sacks from the bottom and shoot them back over the top, unless, of course, they are drawing out for their day-to-day feeding.

Precautions with oil cake are much the same as with grain. A useful tip is to lay the bags as a bricklayer lays his bricks, header and stretcher. Several smaller stacks, say not more than two tons each, are better than one big one. The barn must be well ventilated and the damp kept out. A couple of hurricane lanterns are surprisingly effective as damp-protectors. Extracted meals, such as ground nut, palm kernel, soya bean, etc., should be watched particularly, for most of them have lost their natural oil protection and are apt to go "pinny" quicker than other sorts. Compound cakes, if well cooled off, can be kept a surprising time if carefully stacked or shot out in shallow heaps on the barn floor.

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How to Judge Silage

Hints on Quality and Feeding Points.—Having made silage, it is important to be able to estimate its feeding value; it may be good enough to replace cake, or it may be no more than a substitute for hay. High quality, cake-substitute silage can only be made from the right crop cut at the right time and properly ensiled. It will be golden yellow or light brown in colour, or have a greenish tinge. Its smell will be faint and acid, but even if it is vinegary or fruity the silage will still be satisfactory. All plant parts will be clearly recognisable and retain their original form. Silage passing these tests must also have been made from very leafy grass, 4 to 10 inches long, with no grasses in or near flower; or from clover, lucerne or sainfoin cut at the early flowering stage, preferably in bud. All other silage can only be used to replace hay or roots or oat straw, including silage made from grasses in flower, oats and vetches alone or with peas or beans, maize and sugar beet tops.

The Ministry has issued a new "Growmore" Leaflet (No. 50) that makes these and other points quite clear. It deals as well with quantities of silage of different quality that should go into the ration and contains a table of seven common faults in silage, their cause and the remedy. It is free on application to the Ministry at Hotel Lindum, St. Annes-on-Sea, Lancs.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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Quo Vadis?

To the Editor of the Veterinary Record.

Sir,—In a recent letter which you published Colonel Dixon reminds us of the extraordinary lack of foresight that led to the extinction of so many veterinary departments which had been built up by our local authorities as an integral part of the Public Health Service and as a result of over a quarter of a century of strenuous effort.

By so much was our clock set back. It represents the greatest veterinary blunder of our times—a blunder that cannot readily be overlooked by any who are interested in the progress of our science.

Colonel Dixon wrote a letter of warning at the time the Bill was under consideration. He was in the service and he knew.

Let us hope that no further attempt will be made from within to interfere with the legislation affecting our science other than through the Council of the R.C.V.S., the body duly elected for the purpose and representative of the whole profession.

The profession's paper was used without any apparent mandate, according to the report of the Yarmouth Congress, to exalt a report by a Departmental Committee on Veterinary Education. It was done in a manner that might have damaged the prestige of the R.C.V.S. No report in our time was better advertised, but if votes mean anything it was rejected by the profession at the last election.

As a member of the Martin Committee that dealt with veterinary education, since many of my colleagues are dead, I shall perhaps be pardoned if I remind some of our members that the Martin Committee secured the status and emoluments now enjoyed by heads of departments and others at the Royal Veterinary College and placed them on a plane of equality with medical and science colleagues. The report of the Loveday Committee would have required the acceptance of a lower standards both as regards status and stipends. This would have been another case of putting our clock back, possibly not quite so bad as the first example I have given it is true, but had this particular recommendation been accepted it would have been deplorable all the same.

It is difficult to regain ground lost in this manner, as will be found by those who are now endeavouring frantically to recover that which was thrown away in the field of food inspection when by an act of consummate folly we lost the sympathy and powerful support of the local authorities of this country with all that it implies.

Yours faithfully,

J. Share Jones.

Pentrebychan Hall,
Nr. Wrexham.
January 21st, 1941.

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THE VETERINARY PROFESSION AND ITS PART IN THE WELFARE OF LIVESTOCK

To the Editor of the Veterinary Record.

Sir,—The great interest rightly shown in so many quarters in Professor Dalling's address on "The Veterinary Profession and its part in the Welfare of Livestock" (*Vet. Rec.* **52**. 35. August 31st) is a remarkable instance of the value of prestige. Excellent as his paper was, Professor Dalling said little that is original or that is not well known to veterinarians concerned with pastoral enterprise all over the world. Many other veterinarians have sounded the same warnings and drawn the same conclusions, but it seems to have been left to Professor Dalling to awaken the necessary general interest. And in that he has done not only veterinary science but farming and the common weal a great service. The unanimity of his audience, expressed by so many and such experienced speakers, is proof enough of the truth of his message to those who have not already learned the truth.

We are all agreed that under existing social and financial conditions it has, so far, proved impossible for existing veterinary knowledge to be used by the community to an extent sufficient to ensure a satisfactory degree of animal health on the farm. That is the essential defect to which all our other difficulties are subordinate. Unless and until the veterinarian is enabled to act as fully and authoritatively on behalf of the farmer as does the works-chemist or the metallurgist on behalf of the manufacturer that defect will remain. Everywhere we find the modern farmer, equipped with excessively evolved types of livestock, trying in vain to achieve a very complicated form of manufacture without the necessary technical information.

It has been suggested that a state veterinary service, such as that of South Africa, would meet the need in Britain. My experience tells me definitely that it would not. Diseases of degeneration, such as mastitis and parasitism, are as great a menace in South Africa as anywhere else. Pathogenic malnutrition is rife. The first cause of disease and degeneration of livestock to-day is an economic one and until this cause is removed veterinary science can only deal with its dreadful effects.

In order to live up to the high standard of city life in a mechanised age agricultural research has encouraged farmers to apply lopsided and unbalanced experiments in eugenics and nutrition. Thereby, for cash purposes, the constitution of the animal has been exploited beyond

the bounds of physiological endurance, resulting in degeneration and disease. Consequently, the first duty of the veterinarian begins in the highest council of the nation and of the world. That is to say, bluntly, that so far as animal health is concerned the existing social and financial system is a ghastly failure. Some other system must be found that will accord with the nature of things and restore health to the farm, which is the source of our own health.

Meanwhile, and as a necessary preliminary to taking our proper place in the highest council of the nation, we should press for an adequate state veterinary service. Such a service should not only provide sufficient laboratory facilities, but should include veterinary attendance of the sort called "private practice." Existing practitioners in rural districts would be absorbed. It has been fully proved that the experience gained, the service given, and the opportunities for observation obtained, in clinical work on farms, are necessary for the best veterinary service. Where the state veterinary service does not include clinical work, the better part of many a veterinarian atrophies for lack of interest and the service suffers.

Within the state veterinary service, councils should be established to consider and advise authoritatively upon such problems of animal health as excessive glandular development for milk production or the intensive use of pastures. It should even be possible, if believed necessary, to prohibit the pasturing of highly developed breeds in an insufficient environment, or to prohibit, temporarily, measures designed to exceed production beyond a healthy point. An attempt at least should be made to discover and set standards of safety in these respects.

Here is a vista of endeavour greater than any imagined by him who said "So much to do, so little done."

Yours faithfully,
WAKEFIELD RAINEY.

Department of Agriculture,
Devonport,
Tasmania.
November 10th, 1940.

SPRAINED TENDONS AND THEIR TREATMENT

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—With reference to the correspondence that has recently taken place in the *Record* with regard to side-bones and the firing of tendons, the late Professor MacQueen always stated when I was at College that side-bones *per se* never caused lameness. Further, that cases of lameness apparently due to side-bones were caused by small ring-bones underlying the side-bones, frequently difficult to diagnose in the living animal. That has been my experience also.

Some correspondents recite cases of sprained tendons in which, after other treatment had failed, firing has been resorted to with success. Conversely, many successes have been achieved by the application of absorbents after firing has failed.

Yours truly,
WILLIAM S. STEVENS.

c/o Glyn, Mills & Co.,
Whitehall,
London, S.W.1.
January 22nd, 1941.

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TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—The recent articles on firing have been interesting—they would have been more so had the various contributors described the pathology of the cases for which they advised firing, and again the pathological condition set up by firing.

Firing, like a great many other things, is often left until too late. If firing is indicated, it should be done as soon as possible after the diagnosis has been made, providing, of course, the diagnosis is not in any doubt.

I should not like to state the number of horses I have fired—but I was firing horses in my teens—and in those days in Liverpool, there *were* horses.

Yours faithfully,
J. P. RAILTON,

Kington,
Herefordshire.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT OF 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Dec., 1940	17	19	42	3,648	4	11	13	177	97
Corresponding period in ...									
1939	16	17	1	32	—	—	16	164	113
1938	42	51	3	522	1	1	24	66	46
1937	37	37	29	4,922	4	28	28	16	3
Total 1st January to 15th Dec. 1940	544	651	118	15,718	19	41	192	4,850	3,394
Corresponding period in									
1939	682	774	87	10,974	33	73	262	3,127	2,360
1938	794	1,196	179	22,889	46	76	208	897	720
1937	692	825	129	23,633	110	173	245	956	563

NOTE.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.